Basis Curve

Basis Curve

- Basis curve is defined as the relationship between the basis zero rate and it's maturity.

- Basis curves are used as the forecast curves for pricing interest rate products.

- The increase in basis spreads has resulted in large impacts on non-standard instruments.

Basis Curve Construction

- Normally a basis curve is divided into two parts. The short end of the term structure is determined using LIBOR rates. The remaining is derived using basis swaps.

- A basis swap is quoted on the spread of the basis leg as follows

$$r_t^{basis} = r_t^{base} + s_t$$

where

r_t^{basis} the zero rate of the basis curve at time t.

r_t^{base} the zero rate of the base curve at time t.

s_t the quoted spread of the basis swap at time t.

Basis Curve Construction (Cont.)

- The objective of the bootstrap algorithm is to find the zero yield or discount factor for each maturity point and cash flow date sequentially so that all basis curve instruments can be priced back to the market quotes.

- All bootstrapping methods build up the term structure from shorter maturities to longer ones.

Basis Curve Construction (Cont.)

- Assuming that we have had all the yields of a 6-month LIBOR curve up to 4 years and now need to derive up to 5 years.

- Repeat the above procedure till the longest basis swap maturity.

- There are two keys in yield curve construction: interpolation and optimization for root finding.

Interpolation

- The monotone convex interpolation is more rigorous. It meets the following essential criteria:

  - Replicate the quotes of all input underlying instruments.

  - Guarantee the positivity of the implied forward rates

  - Produce smooth forward curves.

- Although the monotone convex interpolation rule sounds almost perfectly, it is not very popular with practitioners.

Optimization

- Bootstrapping process needs to solve a yield using a root finding algorithm.

- It needs an optimization solution to match the prices of curve-generated instruments to their market quotes.

- Another popular algorithm is the Excel Solver, especially in Excel application.

Thank You

Reference:

https://finpricing.com/lib/EqBarrier.html